International Journal of Pediatric Otorhinolaryngology 79 (2015) 1732–1735

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Postoperative complications in obese children undergoing adenotonsillectomy☆

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ARTICLE INFO

Article history:
Received 28 April 2015
Received in revised form 25 July 2015
Accepted 27 July 2015
Available online 3 August 2015

Keywords:
Adenotonsillectomy
Obese
Safety
Postoperative complications

ABSTRACT

Objective: The incidence of obesity in the pediatric population is increasing. To date, data are limited regarding safety of adenotonsillectomy in this patient population. The purpose of this study is to assess perioperative outcomes of adenotonsillectomy in the obese pediatric patient.
Methods: A review of the 2012 Kids' Inpatient Database (KID) was conducted to compare patients with clinical modification codes for adenotonsillectomy plus obesity to patients with clinical modification codes for adenotonsillectomy alone.

Elements for comparison included patient demographics and concurrent discharge. An in depth review of risk factors associated with respiratory complications in obese patients was also conducted.
Results: A weighted total of 899 obese and 20,535 non-obese patients admitted after adenotonsillectomy were identified. When these two groups were compared, respiratory complications were found in 16.2% of obese and 9.6% of non-obese patients ($p < 0.0001$). A diagnosis of respiratory failure or pulmonary insufficiency was statistically more common in obese patients when compared to non-obese patients (5.0% versus 3.0%, $p = 0.007$). In obese patients, respiratory complications were associated with male gender, low income, and concomitant asthma on multivariate analysis ($p = 0.01$, 0.004, and 0.007 respectively).
Conclusion: Performing adenotonsillectomy on the obese pediatric patient is safe. When performing adenotonsillectomy on this patient population, one must be aware that respiratory events are the most common type of complication and risk of respiratory complications is higher in males, patients of low socioeconomic status, and patients with comorbid asthma, regardless of race or insurance status.

1. Introduction

Adenotonsillectomy (T&A) is one of the most common surgeries performed on the pediatric patient [1]. Overall, T&A is a safe procedure with postoperative hemorrhage rates ranging from 1 to 5% and respiratory complications ranging from 2 to 11% [2–6]. These complication rates are based on the general pediatric population and do not specify subsets that may be at higher risk. It is understood, however that some patients are at higher risk of postoperative complication and the AAO-HNS has recommended overnight observation of patients under the age of 3 years, those with severe obstructive sleep apnea or patients significant medical comorbidities such as Down Syndrome and cardiac anomalies. In addition, many centers are routinely admitting obese patients for overnight observation after surgery. With the recent, high profile, postoperative mortality in an obese pediatric adenotonsillectomy patient and the incidence of obesity in children age 6–11 more than doubling in the past 30 years [7,8], a better understanding of the risk profile in the patient population is warranted.

Multiple previous studies have investigated complication rates of T&A in obese patients, and have found that obesity is associated with increased rate of respiratory complications and length of stay [9–12]. These studies have been single institution and many have been with small patient size. Due to the limited nature of most of these studies, it is unknown what subgroups of obese patients are at increased risk of perioperative morbidity.

Administrative databases have demonstrated utility in safety and quality improvement due to their ability to identify macro-level

☆ Presented as a poster at the 2015 ASPO Spring Meeting, Boston, MA, April 24, 2015.

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http://dx.doi.org/10.1016/j.ijporl.2015.07.038
0165-5876/

trends that may not be apparent in single-institution studies [13]. This includes the ability to identify demographic trends and comorbid conditions associated with specific diagnoses. To date, administrative databases have not been utilized to investigate the safety of T&A in the obese pediatric patient.

The purpose of this study is to utilize a national, administrative database to produce a national representation of the safety of adenotonsillectomy in overweight and obese patients. In addition, due to the increased sample sizes afforded by pediatric databases, the second purpose of this study is to investigate whether perioperative complications are more common in specific subgroups of obese patients.

2. Methods

Data were obtained from the Kids' Inpatient Database (KID) 2012, part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). It is the only all-payer pediatric-only database and samples discharge data of patients from birth to under 21 years from all non-rehabilitation hospitals in participating states [14]. As with the use of all administrative databases for research purposes, no IRB approval was required for its use.

A search was conducted for patients discharged with recorded ICD-9 code 278 (overweight and obesity) and CPT code 28 (adenotonsillectomy). All patients with these diagnosis codes were included in analysis. A diagnosis of overweight or obese status was made by ICD-9 codes as entered by coders based on data within the patient chart at time of billing as opposed to raw BMI data due to the nature of data available in the KID database. Demographic data obtained included age, race, gender, median income quartile for zip code, and payer status (defined as public aid versus private insurance). Concurrent discharge diagnoses and length of stay were also recorded. Discharge diagnoses pertaining to respiratory events were categorized into major and minor (Table 1). In addition, the incidence of diagnosis code for cardiac complications resulting from a procedure (ICD-9 997.1) was also observed. Finally, the incidence of postoperative hemorrhage was also recorded (ICD-9 998.11). These events were compared to demographic and other comorbidity data to determine if any trends were present. An additional search was performed on patients in the KID database with CPT code 28 without an associated ICD-9 code 278 (all non-obese adenotonsillectomy patients). Data on obese adenotonsillectomy patients was then compared to data on non-obese tonsillectomy patients admitted after procedure to determine if these findings differed from the general population. Data for analysis were weighted according to methods described in the HCUP tutorial [15]. In accordance with the Data Use Agreement, no data with numbers less than 10 were reported. Data were analyzed using Chi square and multivariate analysis. Statistical significance was defined as $p < 0.05$.

Table 1
Categorization of major and minor respiratory events after adenotonsillectomy.

Major event (ICD-9)	Minor event (ICD-9)
Pulmonary insufficiency following trauma and surgery (518.5)	Other respiratory distress (786.09)
Acute respiratory failure (518.81)	Hypoxemia (799.02)
Other pulmonary insufficiency (518.82)	Other respiratory complications (997.39)
Acute on chronic respiratory failure (518.84)	

3. Results

3.1. Demographics

A total of 611 overweight/obese (heretofore referred to as "obese") patients were identified (weighted $N = 899$). 13,891 adenotonsillectomy patients without a diagnosis of overweight/obesity were also identified (weighted $N = 20,535$). The average age of obese T&A patients was 10.2 years whereas non-obese T&A patients averaged 7.0 years ($p < 0.0001$). There was no significant difference in the gender distribution between the two groups but a difference in racial distribution, payer status, the presence of a diagnosis of obstructive sleep apnea (OSA), and income quartile was found (Table 2).

3.2. Postoperative outcomes – obese versus non-obese patients

In obese adenotonsillectomy patients, major and minor respiratory complications were most common, occurring in 146 weighted patients (16.2%), with major respiratory complications occurring in 45 weighted patients (5.04%). These events were statistically more common than in the non-obese T&A patient with respiratory complication rates and respiratory failure/pulmonary insufficiency rates of 1984 (9.7%) and 617 (3.0%) weighted patients respectively ($p < 0.0001$ and $p = 0.007$ respectively). Cardiac complications resulting from a procedure were also investigated, however they were rare in both groups. Hemorrhage complicating a procedure was noted in 50 weighted obese patients (5.6%) and 2143 weighted non-obese patients (10.4%) ($p < 0.0001$). There were no patient deaths in obese T&A patients.

In addition to postoperative complications, average length of stay (LOS) was also compared between obese and non-obese patients undergoing T&A. Average LOS in obese patients was 2.67 days, with 76.92% of patients being discharged in two or fewer days (range 0–189 days, standard deviation 8.21 days). This average LOS was not significantly different than the average LOS of

Table 2
Demographic comparison of obese and non-obese T&A patients.

Demographic measure	Obese patient weighted N (%)	Non-obese patient weighted N (%)	p value
Racial distribution			<0.0001
White	226 (25.2)	8682 (42.3)	
Black	243 (27.0)	3483 (17.0)	
Hispanic	246 (27.3)	3231 (15.7)	
Asian	23 (2.6)	371 (1.8)	
Other	29 (3.2)	901 (4.4)	
Unknown	132 (14.7)	3867 (18.8)	
Income quartile			<0.0001
<25%	336 (37.4)	5875 (28.6)	
25–49%	211 (23.4)	4822 (23.5)	
50–74%	183 (20.4)	4743 (23.1)	
75–99%	145 (16.1)	4657 (22.7)	
Unknown	24 (2.7)	438 (2.1)	
Payer status			<0.0001
Medicaid	535 (59.5)	8860 (43.1)	
Private	286 (31.8)	10,241 (49.9)	
Self-pay	34 (3.7)	584 (2.8)	
Other	39 (4.3)	119 (0.6)	
Unknown	6 (0.6)	731 (3.6)	
OSA status			<0.0001
OSA	697 (77)	13,186 (64.2)	
No OSA	202 (23)	7349 (35.8)	
Gender			0.468
Male	523 (58.1)	11,498 (55.6)	
Female	375 (41.7)	8753 (42.6)	
Unknown	1 (0.1)	374 (1.8)	